

# REMAINS OF CHESTNUT WOOD PASTURES AS PART OF AGROFORESTRY SYSTEMS IN SLOVAKIA

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## Abstract

Slovakian agroforestry does not officially exist yet, although remnants of these traditional systems developed in the past, which have high environmental and cultural value, are still to be found. Slovakia due to its natural conditions also has great potential for establishment of modern agroforestry systems, which has been developed during the last decades by many research centres in Europe. The contribution is devoted to one of the remains of a previously applied agroforestry systems in Slovakia – chestnut (*Castanea sativa* Mill.) wood pastures. Unfortunately, today they are getting worse markedly due to insufficient management and spreading parasitic fungus *Cryphonectria parasitica*. Populations of this useful crop are small today, but they are important habitats that would deserve more scientific interest. The main objectives of the contribution are focus on the mapping of chestnut population in the south part of central Slovakia and chestnut biocultural value assessment in the given traditional landscape types.

**Keywords:** agroforestry systems; chestnut; bioculture value; old stables; traditional land use

## Introduction

### Current status and national initiatives related to agroforestry systems in Slovakia

In Slovakia, as in many other European countries, we have had a long period of time when our administrative and governance structures were considered to be legitimate to use only agriculture or forestry. This condition still persists and the term "agroforestry" does not even exist today in any Slovak legislation, despite the fact that such systems have been used in the past and their remains are present in Slovakia even today.

The professional discussion about agroforestry systems and possibilities of their utilization and establishment in the conditions of Slovakia started to be initiated after the participation at the 2nd European Agroforestry Conference in Cottbus (Germany) in 2014. Since 2015 we have published several agroforestry contributions in different journals and we are currently registering the increased interest of landowners regarding establishment of agroforestry systems. Our intention is to gradually connect and organize both scientific community and farmers related to agroforestry systems in Slovakia. At the same time we implement activities in creating expert background and preparing proposals to modify national legislation so that agroforestry systems can become a legal part of agricultural land management in the near future. In the field of research, since 2015 we have been working on the project supported by the Slovak Research and Development Agency (APVV) with title "Research possibilities of growing of common juniper (*Juniperus communis* L.) for the production of fruit", where the most effective system is "juniper pastures". In 2017 we again submitted to the APVV a proposal for the project with name "Research possibilities of using of black walnut (*Juglans nigra* L.) and sweet chestnut (*Castanea sativa* Mill.) in agroforestry systems in Slovakia". We are currently preparing a proposal for the research program "Agroforestry systems for combination production and more efficient use of agricultural land" as a research intention for long-term strategic research.

### Historical background and current state of chestnut occurrence and cultivation in Slovakia

Sweet chestnut (*Castanea sativa* Mill.) is one of the oldest non-native woody plant species in Slovakia. It is supposed that chestnut was brought for the first time to the area of current Slovakia by ancient Romans. Probably some old chestnut trees grown near the capitol Bratislava on slopes of Little Carpathians Mts. could be descendants of this introduction. However, the first historically proven chestnut introduction was done by count Forgach in the 13th century to the oak forest under the castle Gymesh near the village Jelenec. The original chestnut grove planted on an area of about 1 ha had turned during centuries to the naturally regenerated high forest, which covers at present about 15 ha. The last most important introduction of chestnut to the territory of the present Slovakia is dated back to 16th and 17th centuries to the period of Ottoman invasions. The primary centre of this introduction is considered the town Modrý Kameň, particularly the surroundings of the local castle. Nowadays, chestnuts grow at this location on several sites in the series of old orchards of seed origin. In each introduction centre the majority of chestnut trees are more than 100 years old and some trees reach the age of about 300 years. Old chestnut trees can be also found on other localities in old orchards established apparently from the chestnut seeds from the introduction centres.

At present, chestnut is widespread at more than 220 localities in Slovakia. It occurs in the southern part of the country, on steep slopes with altitudes ranging from about 200 to 400 m a.s.l. Distribution of chestnut is geographically limited to the latitude range 48°– 49° N and longitude range 17°– 49° E. On localities with chestnut occurrence, long term mean annual air temperature fluctuates from 9° C to 10° C and long term mean annual sum of precipitation between 600 and 700 mm. Chestnut grows here outside the recorded natural distribution range and therefore doesn't have optimal climatic conditions. In Slovakia, chestnut occurs mostly in extensive old orchards, with a total area of about 130 ha, of which 95 ha represent the old, more than 100 years old trees of seed origin (Figure 1). Young trees between 30 – 35 years old are registered on the area around 35 ha. The area on which chestnut is considered as forest tree species is more precisely recorded. It corresponds to approximately 1405 ha, including mixed forest stands of chestnut with other tree species (*Tilia* spp., *Pinus sylvestris*, *Quercus* spp.).

Currently, the health condition as well as chestnut production have rapidly declined as a result of enormous dying out of chestnut individuals infected by fungus *Cryphonectria parasitica* (Murr.) Barr. (Bolvanský et al. 2008).



Figure 1: Active chestnut wood pasture in central Slovakia grazed by sheep.

## Main objectives of the research

The submitted contribution is devoted to one of the remains of a previously applied agroforestry systems in Slovakia – chestnut wood pastures. The main objective of the research was to locate the current chestnut occurrence and its present state in the Modrý Kameň area (southeast Slovakia) based on detailed mapping and to assess the chestnut biocultural value in the traditional landscape types, which are present in the study area. Chestnut trees have been creating wood pastures here. Unfortunately, today they are getting worse markedly due to insufficient management.

## Materials and methods

Modrý Kameň area is situated in the southern part of central Slovakia and its vicinity represents the largest area with the chestnut occurrence in Slovakia. The estimated number of trees growing in this area is 1500 – 2000. The natural values were represented by high nature value (HNV) farmlands (Keenleyside et al. 2014) and habitats of European importance (Galvánek and Lasák 2011). In the study area, the habitat of Lowland Hay meadows (no. 6510) was identified. The cultural values related to chestnuts were represented by historical farm buildings in the vicinity of chestnuts dispersed in the countryside. The residents of villages usually owned agricultural plots with fields, meadows, pastures and vineyards, where specific seasonal dwellings called “chišky” and “koňice” were built (Chovanová et al. 2006). The English equivalent of both the words for this type of buildings is a stable. The geospatial relationship between chestnuts and old stables was tested by the distance matrix using the Distance Matrix Analysis Tool in QGIS. The traditional landscape types were adapted from the Atlas of the Slovak Republic (Miklós and Hríárová 2002). Chestnut individuals and its area formations were identified and positioned in 6 cadastral districts (Dolné Príbelce, Horné Príbelce, Dolné Plachtince, Stredné Plachtince, Horné Plachtince, and Modrý Kameň). A touristic Global Navigation Satellite System (GNSS) Garmin (2010) was used for the positioning of chestnut trees and historical farm buildings.

## Results and discussion

101 individuals and 123 groups (46 ha) of chestnut: 11 groups > 31 individuals, 10 groups of 16 – 30 individuals, 34 groups of 6 – 15 individuals, 68 groups of 2 – 5 individuals were identified and positioned in the field. Chestnut trees most frequently occurred in the extensively used Corine Land Cover (CLC) patches with pastures and with heterogeneous agricultural areas – “Land principally occupied by agriculture with significant areas of natural vegetation”, in parallel coinciding with HNV farmlands and Lowland hay meadows and with local occurrence of the protected bat species. The analysis of the geospatial relationship between chestnut individuals (49), centroids of its area formations (54) and old stables (26) showed that the most frequent distances of the nearest neighbour ranged from 82.79 m to 205.18 m. While the distance between buildings and chestnuts increased, the frequency of chestnuts and old stables decreased (Pástor et al. 2017).

Without a constant care (regular mowing and cattle grazing), chestnuts are heavily prone to damage and disease. They slowly decay and stop producing quality fruits (Michon 2011). They face an inadequate maintenance in Slovakia. Nowadays, chestnut preservation and protection according to the Act on Nature and Landscape Conservation is impossible as it is listed among the introduced tree species. A similar legal status of the chestnut preservation is documented in Italy by Agnoletti (2007). The absence of chestnut groves in the list of habitats meriting a protection is mostly due to its artificial origin, but also for the assumed low biodiversity value of these woods as compared with natural forests.

Suitable case of fruit agroforestry would be just chestnut planting in pastures and meadows. Chestnuts were frequently found in the vicinity of old stables. These findings partially confirmed the usage of chestnut products for cattle breeding. Deeper social research would be expected to verify that chestnuts were an essential part of pastoral life of inhabitants in the study area (Pástor et al. 2017).

In Slovakia, chestnut belongs to the marginal nut tree species and minor fructiferous tree species. However, it contributes significantly to the preservation of traditional agricultural landscape and also it is a very suitable tree species for establishment of agroforestry systems. Populations of this useful crop are small today, but they are important habitats that would deserve more scientific interest.

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